What is claimed is:

1. A bismuth titanium silicon oxide of formula (1) below having a pyrochlore phase:

$$Bi_2(Ti_{2-x}Si_x)O_{7-y} \qquad ...(1)$$

where x is a figure ranging from 0.8 to 1.3, and y is a figure ranging from −1 to 1.

2. A bismuth-titanium-silicon oxide thin film of formula (1) below having a pyrochlore phase:

$$Bi_2(Ti_{2-x}Si_x)O_{7-y} \qquad ...(1)$$

where x is a figure ranging from 0.8 to 1.3, and y is a figure ranging from −1 to 1.

3. A method for forming a bismuth-titanium-silicon oxide thin film of formula (1) below having a pyrochlore phase:

$$Bi_2(Ti_{2-x}Si_x)O_{7-y} \qquad ...(1)$$

where x is a figure ranging from 0.8 to 1.3, and y is a figure ranging from −1 to 1, the method comprising:

(a1) supplying a precursor mixture containing a bismuth precursor, a titanium precursor, and a silicon precursor into a vaporizer in a non-oxidative atmosphere to adsorb the precursor mixture onto a surface of a substrate; and

(b1) oxidizing the precursor mixture adsorbed onto the surface of the substrate to deposit atomic layers of the precursor mixture on the surface of the substrate.

4. The method as claimed in claim 3, further comprising supplying inert gas over the surface of the substrate before step (b1).

5. The method as claimed in claim 3, further comprising annealing after step (b1).

6. The method as claimed in claim 5, wherein the annealing is performed at a temperature of 500-800℃ in an oxidative atmosphere, in an inert gas atmosphere, or in a vacuum.

7. The method as claimed in claim 3, wherein, in step (a1), the precursor mixture containing the bismuth precursor, the titanium precursor, and the silicon precursor is supplied into the vaporizer by direct liquid injection.

8. The method as claimed in claim 3, wherein the bismuth precursor, the titanium precursor, and the silicon precursor in the precursor mixture used in step (a1) are dissolved in at least one solvent selected from the group consisting of ethylcyclohexane, tetrahydrofuran, n-butyl acetate, and butyronitrile.

9. The method as claimed in claim 3, wherein the non-oxidative atmosphere in step (a1) is created using inert gas.

10. The method as claimed in claim 3, wherein, in step (a1), the bismuth precursor is at least one selected from the group consisting of $Bi(MMP)_3${Tris(1-methoxy-2- methyl-2-propxy)bismuth}, $Bi(phen)_3$, where "phen" indicates phenyl, and $BiCl_3$; the titanium precursor is at least one selected from the group consisting of $Ti(MMP)_4${Tetrakis(1-methoxy-2-methyl-2-propoxy)titanium}, $TiO(tmhd)_2$, where "tmhd" indicates 2,2,6,6-tetramethylheptane-3,5-dionate, $Ti(i\text{-}OPr)_2(tmhd)_2$, where "i-OPr" indicates isopropyl, $Ti(dmpd)(tmhd)_2$, where "dmpd" indicates dimethyl

pentanediol, $Ti(depd)(tmhd)_2$, where "depd" indicates diethyl pentanediol, and $TiCl_4$; and the Si precursor is at least one selected from the group consisting of tetraethyl orthosilicate and $SiCl_4$.

11. The method as claimed in claim 3, wherein, in step (b1), the precursor mixture adsorbed onto the surface of the substrate is oxidized by oxygen, ozone, or water vapor.

12. A method for forming a bismuth-titanium-silicon oxide thin film of formula (1) below having a pyrochlore phase:

$$Bi_2(Ti_{2-x}Si_x)O_{7-y} \qquad \ldots(1)$$

where x is a figure ranging from 0.8 to 1.3, and y is a figure ranging from −1 to 1, the method comprising:

(a2) creating an oxidative atmosphere in a reactor; and

(b2) supplying a precursor mixture containing a bismuth precursor, a titanium precursor, and a silicon precursor into the reactor and depositing the precursor mixture on a surface of a substrate by vapor deposition.

13. The method as claimed in claim 12, further comprising annealing after step (b2).

14. The method as claimed in claim 13, wherein the annealing is performed at a temperature of 500-800℃ in an oxidative atmosphere, in an inert gas atmosphere, or in a vacuum.

15. The method as claimed in claim 12, wherein, in step (a2), the oxidative atmosphere is created using oxygen, ozone, or water vapor.

16. The method as claimed in claim 12, wherein, in step (b2), the precursor mixture containing the bismuth precursor, the titanium precursor, and the silicon precursor is supplied into the reactor by direct liquid injection.

17. The method as claimed in claim 12, wherein the bismuth precursor, the titanium precursor, and the silicon precursor in the precursor mixture used in step (b2) are dissolved in at least one solvent selected from the group consisting of ethylcyclohexane, tetrahydrofuran, n-butyl acetate, and butyronitrile.

18. The method as claimed in claim 12, wherein, in step (b2), the bismuth precursor is at least one selected from the group consisting of $Bi(MMP)_3${Tris(1-methoxy-2- methyl-2-propxy)bismuth}, $Bi(phen)_3$, where "phen" indicates phenyl, and $BiCl_3$; the titanium precursor is at least one selected from the group consisting of $Ti(MMP)_4${Tetrakis(1-methoxy-2-methyl-2- propoxy)titanium}, $TiO(tmhd)_2$, where "tmhd" indicates 2,2,6,6-tetramethylheptane-3,5-dionate, $Ti(i\text{-}OPr)_2(tmhd)_2$, where "i-OPr" indicates isopropyl, $Ti(dmpd)(tmhd)_2$, where "dmpd" indicates dimethyl pentanediol, $Ti(depd)(tmhd)_2$, where "depd" indicates diethyl pentanediol, and $TiCl_4$; and the Si precursor is at least one selected from the group consisting of tetraethyl orthosilicate and $SiCl_4$.

19. A capacitor for a semiconductor device, the capacitor comprising:

a lower electrode;

a dielectric film formed on the lower electrode of a bismuth titanium silicon oxide of formula (1) below having a pyrochlore phase:

$$Bi_2(Ti_{2-x}Si_x)O_{7-y} \qquad ...(1)$$

where x is a figure ranging from 0.8 to 1.3, and y is a figure ranging from −1 to 1; and

an upper electrode formed on the dielectric film.

20. A transistor for a semiconductor device, the transistor comprising:

a source electrode;

a drain electrode;

a substrate having a conductive region between the source electrode and the drain electrode;

a gate dielectric film formed on the conductive region of a bismuth titanium silicon oxide of formula (1) below having a pyrochlore phase:

$$Bi_2(Ti_{2-x}Si_x)O_{7-y} \qquad ...(1)$$

where x is a figure ranging from 0.8 to 1.3, and y is a figure ranging from −1 to 1; and

a gate electrode formed on the gate dielectric film.

21. An electronic device comprising a capacitor and/or a transistor, wherein the capacitor includes a lower electrode, a dielectric film formed on the lower electrode of a bismuth titanium silicon oxide of formula (1) below having a pyrochlore phase, and an upper electrode formed on the dielectric film; and the transistor includes a source electrode, a drain electrode, a substrate having a conductive region between the source electrode and the drain electrode, a gate dielectric film formed on the conductive region of a bismuth titanium silicon oxide of formula (1) below having a pyrochlore phase, and a gate electrode formed on the gate dielectric film:

$$Bi_2(Ti_{2-x}Si_x)O_{7-y} \qquad ...(1)$$

where x is a figure ranging from 0.8 to 1.3, and y is a figure ranging from −1 to 1.

22. The electronic device as claimed in claim 21, wherein the electronic device is a dynamic random access memory.